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Mini-lap cholecystectomy: Modifications and innovations in technique

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ABSTRACT

Background: As with any technology-driven field, laparoscopic surgery has made tremendous progress in recent years. Since the performance of first laparoscopic cholecystectomy by Prof Dr Med Erich Mühe of Böblingen, Germany 1985, this procedure has overtaken open cholecystectomy as the treatment of choice in cholelithiasis. However due to the cost incurred thereof and surgical training needed, open cholecystectomy is still performed on a very large scale in most parts of the third world countries. We tried to modify the conventional cholecystectomy to a minimal access approach (with minimal required infrastructure) to suit majority of patients with cholelithiasis in lieu of cost and morbidity.

Objective: To assess the outcome of modified mini-lap cholecystectomy and report our experience with our innovations and modifications of the technique.

Patients and methods: Between May 2006 and May 2008, two hundred patients with cholelithiasis aged between 15 and 56 years underwent mini-lap cholecystectomy in a prospective study in Government medical college Srinagar. Our surgical approach was carried out using a 3–5 cm oblique incision located two finger breadths below the costal margin; fashioned more laterally with a muscle cutting or splitting technique. The outcome was assessed in terms of intraoperative and postoperative parameters. The median (range) age was 38 (15–56) years and there were 143 females and 57 males in the study. All the procedures were completed successfully without any complications, though one patient needed the extension of incision as in conventional cholecystectomy.

Results: All the procedures were completed successfully. The mean (range) operative time was 35 (20–110) min and the average blood loss was 30 ml. The mean (range) hospital stay was 2 (1–5) days. All patients returned back to routine work within 9 days of surgery. The mean follow-up was 12 (7–14) months.

Conclusions: These results confirm that mini-lap cholecystectomy by our modified approach is safe, feasible and has lesser morbidity and postoperative pain as compared to conventional open cholecystectomy. The technique is cost effective, easy to practice and can benefit majority of patients who otherwise cannot afford the laparoscopic surgery. Hence it can serve as an alternative to the gold standard laparoscopic cholecystectomy with almost comparable results.

1. Introduction

The introduction of laparoscopy opened up a new chapter in the surgical history. This greatly minimized the invasion without compromising the vision.[1] The first laparoscopic cholecystectomy was performed by Prof Dr Med Erich Mühe of Böblingen, Germany 1985. The procedure progressed at such a speed that it has become the gold standard for management of cholelithiasis.[1] This procedure incurs costly equipment and the need for surgeon training at a very large scale. Due to these factors this procedure has still not replaced the open cholecystectomy in most parts of the third world countries. During 1980s and in the early 1990s, it was shown that the conventional large subcostal incision in cholecystectomy could be replaced by a much smaller incision, giving a shorter convalescence. This conclusion was later supported by results in three out of four randomized controlled trials. This new modification was named as Mini-Laparotomy (mini-lap) cholecystectomy. It was first performed by Dubois and Berthelot.[2] We decided to analyze the safety and feasibility results of this procedure. We modified the approach and also introduced some innovations in technique, to make this procedure surgeon friendly. The patient safety was kept as a priority at all times.

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Fig. 1. Instruments for mini-lap cholecystectomy.

Fig. 3. Skin, subcutaneous tissue cut.

2. Patients and methods

This prospective study was conducted in the Department of Surgery of the Government Medical College Srinagar, between May 2006 and May 2008. Two hundred consecutive patients with gallstone disease who underwent mini-lap cholecystectomy between May 2006 and May 2008 were included in this study. There were 143 women and 57 men. The median age was 38 years (range 15–56). 139 patients had gallstones without any evidence of acute inflammation of the gallbladder, whereas 31 had acute cholecystitis, 22 had mucocele and 8 had pyocele. All the cases were done by a single surgeon on elective basis. The patients were initially evaluated in the out-patient department (OPD) and then admitted for surgery. On admission a detailed history was asked from the patient including the presenting complaints, duration of the complaints, past history especially with reference to previous operation(s). Each patient and his/her attendants were fully explained the nature of the surgery in the language which they understood, and informed consent was taken from the patient.

Investigations performed included routine investigations like Complete Haemogram, Kidney Function Tests, Liver function tests, ECG, chest radiograph and ultrasonography. All the patients had their blood typed and cross matched. Pre-anesthetic checkup was done in all patients. Preoperative prophylactic antibiotics (Inj. Ceftriaxone 1 g IV at the time of intubation) were given in all cases.

2.1. Operative technique

The patient was initially positioned supine for intravenous access, the induction of general anesthesia and endotracheal intubation. The table was given a right lateral turn of 10–15°. The surgical armamentarium is depicted (Fig. 1). The incision was made to the right of the midline, fashioned more laterally and ran obliquely about two finger breadths below the right costal margin (Fig. 2). The average length of the incision was 3–5 cm; however for the patient safety, the incision would always be increased in difficult situations. Most of the times muscle was cut using diathermy; however muscle splitting was done in thin and lean patients (Figs. 3 and 4). We used two Langenbuch's retractors to facilitate this (Fig. 5). The fundus of gallbladder was grasped by a sponge holding forceps. Two small ribbon-like packs cut from the standard abdominal packs were introduced to expose the triangle of Calot's; two smallest size Deaver's retractors were handy for this. The gallbladder was decompressed as a routine in all cases and the iatrogenic perforation made thereby sealed, with a Kelly's clamp (Figs. 6–8). In patients having gallbladder studded with stones and

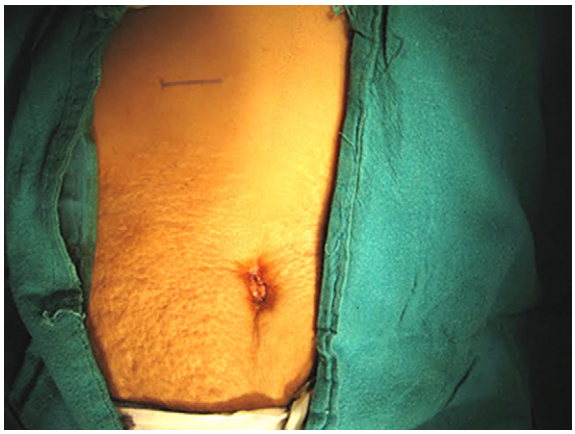

Fig. 2. The topography of oblique incision in right hypochondrium.

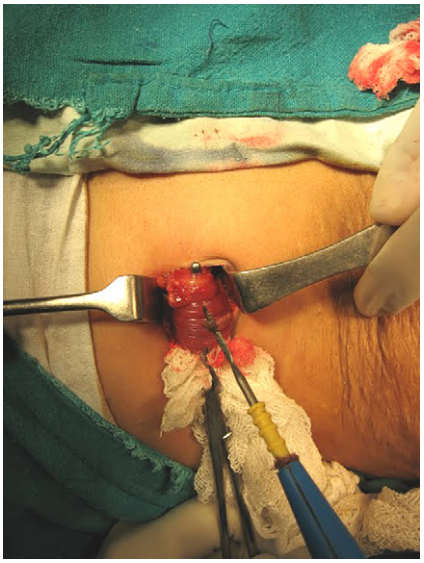

Fig. 4. Rectus abdominis being cauterized and cut.

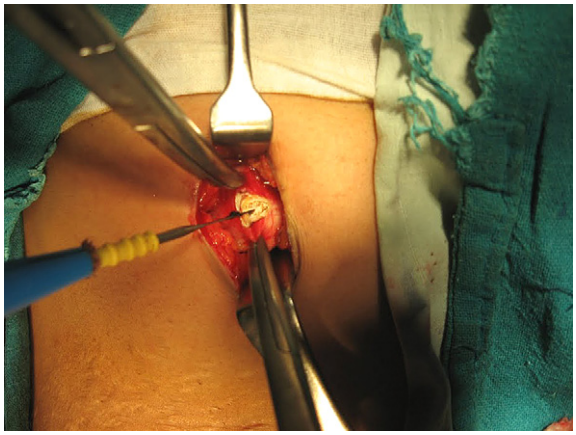

Fig. 5. Posterior rectus sheath and peritoneum being cauterized and cut.

the ones with mucocele and/or pyocele (with impacted stones in the Hartmann's pouch), cholecystolithotomy was performed using Desjardin's forceps. The dissection was begun right over the triangle of Calot's and the cystic artery and cystic duct dissected clear. In majority of the patients the cystic artery was cauterized and the ducts ligated. We used Kelly's clamp for ligating the cystic duct and tightened the knot inside the operative field. We used a right angled clamp to pass a suture around the cystic duct. The two ends were taken in Kelly's clamps and a loop was made outside the wound. The loop was positioned in place by the assistant with a simple forceps. The Kelly's clamp holding the shorter end of the thread was introduced into the field and the knot tightened. As the knot was tightened, the inner clamp would hold the thread closer to the duct. The traction on the clamps was applied in an oblique fashion. The whole knotting was done under vision. In view of paucity of space, cystic duct was divided with a number 15 blade. The gallbladder was dissected off liver bed with the right index finger of the surgeon. There occurs with minimal blood loss from liver bed by this technique (Figs. 9 and 10). The hemostasis was secured and incision closed back in layers followed by antiseptic dressing (Fig. 11). Intraoperative drain was used when deemed necessary (Fig. 12).

2.2. Postoperative care

For the immediate postoperative pain relief, injectable diclofenac sodium 50 mg intramuscular was used. Later oral diclofenac

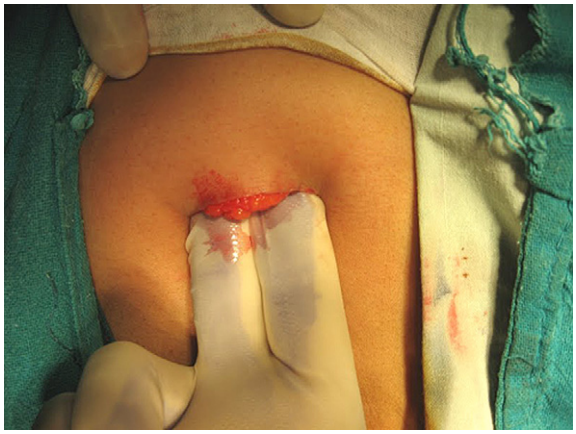

Fig. 6. Middle and index finger put into supra-hepatic pouch through the incision.

Fig. 7. A sleeve of gauze cut from the standard abdominal pack.

50 mg tab was used. Patients were made ambulatory on the next day. Orals were usually started on the first postoperative day and the patients discharged home the day after. After discharge from hospital patients were called for follow-up at 1 week, 4 weeks, and 6 months thereafter.

The following parameters were recorded in a pre-structured Proforma.

1. Information on gender, age, body mass index, co-morbidities and past surgical history.
2. Estimated blood loss, transfusions.
3. Operative time: was recorded from the time of incision to closure of skin.
4. Intraoperative complications (major and minor); necessity to enlarge the incision and reasons for the same.
5. Pain: was evaluated by visual analogue scale and the number of analgesic doses required.
6. Infection was assessed by clinical examination and treated as appropriate.
7. Postoperative hospital stay was noted (the day of surgery being day zero).

3. Results and analysis

1. Age and sex: The median age of patients included in the study was 38 years and the range was 15–56 years. There were 143 females and 57 males in the study cohort.

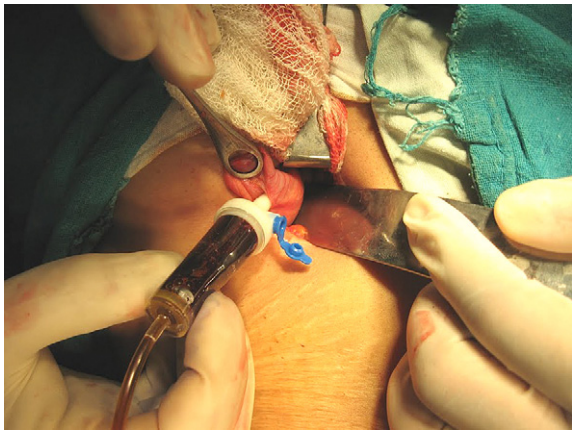

Fig. 8. Gallbladder being decompressed.

Fig. 9. Subcapsular finger dissection of gallbladder.

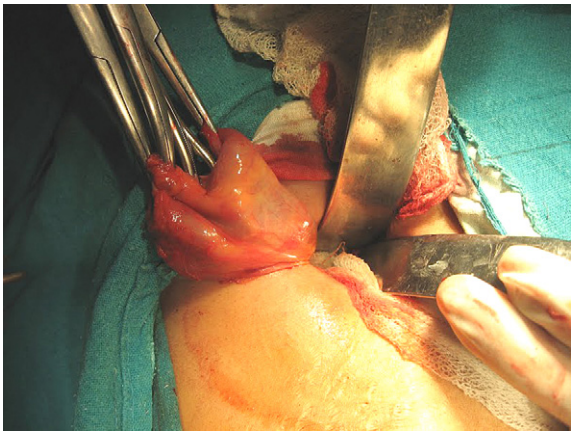

Fig. 11. Gallbladder dissected out.

2. Body Mass Index (BMI): Out of 200 patients, 161 patients fell in the ideal group, 35 were overweight and the remaining four underweight. (Underweight: less than 18.5, Ideal: from 18.5 to 25, Overweight: from 25 to 30, Obese: >30).
3. Presentation of patients: Out of 200 patients, 139 patients has gallstones without any evidence of acute inflammation of the gallbladder, whereas 31 had acute cholecystitis, 22 had mucocele and 8 had pyocele.
4. Previous Interventions/Surgeries: Out of 200 patients, 7 patients had a history of truncal vagotomy and drainage done approximately twenty years back for duodenal ulcer. Two patients had a prior laparotomy performed for perforated duodenal ulcer (primary closure without vagotomy had been done in this case). One patient had undergone drainage of liver abscess under ultrasound guidance. There was a history of hysterectomy in three patients.
5. Peri-Operative details: The operative time (skin to skin), estimated blood loss, requirement of transfusions, intraoperative complications, use of suction/tube drainage, requirement of extending the incision and reasons thereof were recorded.

There were a total of 07 complications (3.5%), including bleeding from cystic artery in one patient who required the conversion to conventional open cholecystectomy. The artery was secured after performing the Pringle maneuver. The patient did not require any blood transfusion though. Other 6 complications were minor in the form of diffuse hemorrhagic ooze from liver bed in 4 patients and bilious ooze in 2 patients. The complications were managed intraoperatively by securing proper hemostasis. The primary incision required to be increased in one patient only (Table 1). There was no common bile duct injury in our study.

6. Conversion to conventional open cholecystectomy: Only one patient demanded increase in the primary incision as in open cholecystectomy for the reasons stated above.
7. Post-operative details: There were a total of six postoperative complications. Four of the patients developed superficial wound infection. This was managed by opening up the skin sutures and antiseptic dressing twice daily with a short course of antibiotics against staphylococcus. One patient developed wound hematoma that was drained and another patient suffered from prolonged ileus for two days in whom Ryle's tube was placed in for treatment (Table 2).
8. Hospital stay: The mean hospital stay was 2 days; the mean being 1–5 days. Most of the patients were discharge home on the morning of second postoperative day. The hospital stay got prolonged upto 5 days in patients who developed superficial wound infection.
9. Return to work: most of the patients returned to their normal routine work within nine days of surgery. However the patients who developed wound infection took a little longer.
10. Post operative pain relief: Postoperative pain was quantified using Visual Analogue Scale (VAS Score) and the total quantity of analgesic, diclofenac sodium, (intramuscular injection plus per oral) required in the postoperative period. On an average 100 mg of diclofenac was needed. It was lesser in patients in whom muscle splitting was done instead of cutting.

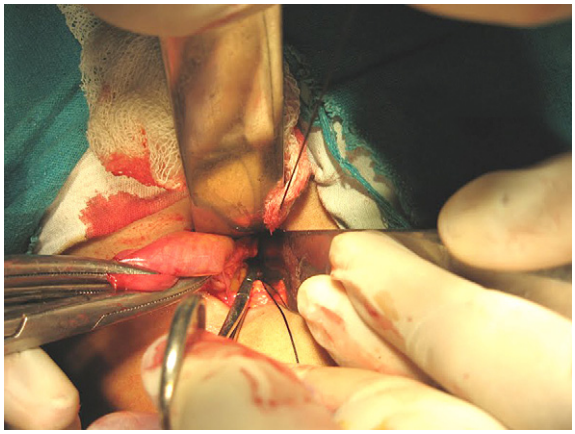

Fig. 10. Kelly's being used for tying the cystic duct.

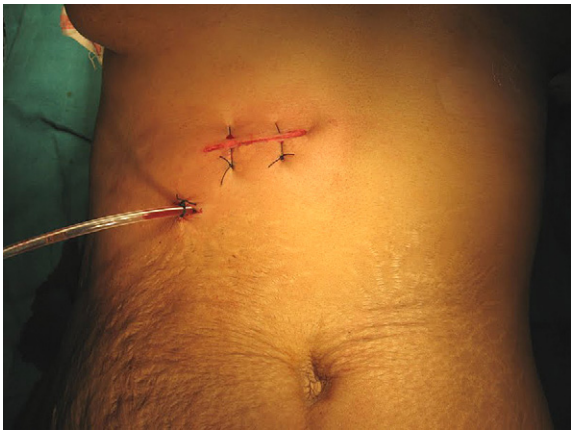

Fig. 12. Postoperative view of the incision.

Table 1
Intraoperative details.

		Mini-lap cholecystectomy
Operative time (min)	Mean	35 min
	Range	20–110 min
Blood loss (ml)	Mean	3 ml
	Range	15–100 ml
Oral Intake (hrs)	Mean	24 h
	Range	18–72 h
Drain removal (if used) (days)	Mean	01
	Range	1–3
Intra-Op complications	Major	1 (0.5%)
	Minor	06 (6.5%)
Blood transfusions		0(0%)

11. Follow up and patient satisfaction: All patients were followed strictly after the surgery. Mean follow up of the patients in the study group was 12 months and a range of 7–14 months. Average scar size was 4.7 cm and the range being 3–5.5 cm. There were no incisional hernias or any other delayed complications.

4. Discussion

The aim of this study was to assess the safety and feasibility of modified mini laparotomy cholecystectomy in routine health care where laparoscopic cholecystectomy is yet to take over as the gold standard.[3] Since some complications were feared of during this procedure, therefore only the experienced surgeon took part in the study. More than 2000 cases of mini laparotomy cholecystectomy have been reported worldwide without any deaths or major common bile duct injuries since the first report in 1982.[4–6] Although a transverse incision in the right upper quadrant is a popular approach for mini-lap cholecystectomy and is less painful than a vertical incision, we prefer to use an oblique incision.[7–9] Most of the previous studies on mini-lap cholecystectomy excluded acute cholecystitis patients. However, we were able to perform the procedure in cases of acute inflammation, mucoceles and pyoceles. We performed decompression of gallbladder as a routine in all cases to facilitate the visualization and dissection of the triangle of Calot's. Special retractors, such as the Harrington–Pemberton retractor or Bookwalter retractor, are recommended by some surgeons, but we found the retraction by the simple instruments to be completely satisfactory.[10] Moreover, our modifications in the technique of dissection of gallbladder off the liver bed (by index finger of the operating surgeon) came in handy to accomplish the surgery successfully. It also saved the operative time and intra-operative bleeding. Assalia and colleagues compared mini-lap cholecystectomy (30 patients) with conventional open cholecystectomy (30 patients) and showed no differences with regard to operative time, operative difficulty or complication rate. However, significantly lower analgesic requirements as well as shorter hospital stay were found in the mini-lap cholecystectomy group. Moreover, 22 patients (73%) in the mini-lap cholecystectomy group returned to normal daily activities 2 weeks after the operation as opposed to 12 (40%) in the open cholecystectomy group. The present study shows clearly that mini-lap cholecystectomy is effective, safe and feasible not only in chronic cholecystitis, but also in an acutely inflamed gallbladder.[11] we accomplished all of the cases successfully and there were no major differences with regard to operative time, level of difficulty or complication rate as that seen in conventional open cholecystectomy. But, as for the post-operative analgesia and return to work are concerned, the mini-laparotomy cohort was far better in terms of lesser analgesia requirements and early return to work. The mean operative time in our study was 35 min with a range of 20–110 min. Operative time was longer at the initial phase of the study especially in cases of chronic cholecystitis, mucoceles and pyoceles but, as we went through the learning curve, the operative time decreased sharply. Postoperative hospital stay in the present series was in agreement with other reports; although in some centres, mini laparotomy cholecystectomy is now performed as day-care or ambulatory surgery.[12] Many of the previously reported series have quoted a complication rate of 2–6% as far as injury to cystic duct and/or common bile duct are concerned with mini-lap cholecystectomy but, we did not have any such major complication in our study. Another likely complication is of increased wound infection due to undue retraction of wound margins and consequent tissue damage.[13] We encountered such complication in four of our patients in this series of 200. The patients were managed conservatively. However, we learnt to avoid this complication of wound infection with the passage of time. The idea of retraction lies in manipulating the retractors around the Calot's triangle to facilitate a good space for dissection for surgeon. The results in our study are in complete concordance with the previous studies.[14]

Table 2
Postoperative details.

Complications	Mini lap cholecystectomy ($n = 200$)
Sup. wound infection	4
Hematoma/Collection	1
Fever	0
Prolonged Ileus	1
Common bile duct injury	0
Other organ injury	0
Total	6 (3%)

5. Conclusions

We have drawn following conclusions:

1. Mini-lap cholecystectomy is an effective minimally invasive surgical procedure with a low morbidity rate, an early return to oral diet, few doses of postoperative analgesic and a short postoperative hospital stay. It may serve as an alternative to laparoscopic cholecystectomy in areas which lack facilities.
2. A small oblique incision in the right hypochondrium is the appropriate choice for mini-lap cholecystectomy in either a normal-sized or obese patients.
3. Mini-lap cholecystectomy can be performed without the use of special instruments, thus reducing the expense.
4. Our modifications can serve in learning and performing this procedure both easily and safely.
5. It is cheaper than other form of minimally invasive surgery for gallbladder disease.

Thus Mini-lap cholecystectomy can serve as an alternative to laparoscopic cholecystectomy particularly in a developing country, where the health-care budget is limited. However, special training is essential to become familiar with the technique.

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Conflict of interest
None to declare.

Presentation details
None declared.

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